Sustainable small-scale biogas production from agro-food waste for energy self-sufficiency

English Live-Webinar, 17th September 2015

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Welcome to the BIOGAS³ Webinar

Before we start, please note the following:

– Make sure your headset or loudspeakers are connected properly, so you can hear the presenters speak

– You do not need a webcam, videos take up too much bandwidth

– Only the presenter will speak, all participant’s microphones will be muted.

– Please use the chat in the lower right corner to leave messages in the chat. RENAC staff will answer your questions as soon as possible
Agenda

1. Introduction BIOGAS$^3$
2. Project results
3. Project services
4. Functionality of Online Training
About BIOGAS³

- Biogas3 implemented within the EU-Programme Intelligent Energy Europe, aiming to promote renewable energies through small scale biogas plants in agro-food industries for self-consumption

Contribution to secure, sustainable and competitively priced energy for Europe by promoting new and renewable energy sources and supporting energy diversification.
The team of BIOGAS³

Partner Organisations:
AINIA, FIAB (Spain)
ACTIA, IFIP (France)
TCA, DEIAFA (Italy)
RENAC (Germany)
FUNDEKO (Poland)
JTI (Sweden)
IrBEA (Ireland)
About BIOGAS³

1. Management
2. Business Collaboration Models
3. Small-scale AD models
4. Build-up of skills, awareness and networking
5. Face-to-face activities
6. Communication
7. Dissemination Activities

www.biogas3.eu
Background of BIOGAS³

• 20-20-20 goals of the EU
• Characterization of agro-food industry:
  – Industry with high amounts of residues
  – Residues need to be transported, reutilized or disposed
  – Subject to national regulations due to hygiene, restrictions etc.
  – Mostly waste management is combined with high costs for company
What is biogas?

• Organic material is decomposed to Biogas under the absence of oxygen.

• Anaerobic Digestion is a complex micobiological process (does also occur in nature: rumen of cows, wetlands).

• The climate damaging effect of methane is 21 times higher than of CO2 (Biogas consists of 50 – 70 % methane).

• Produced forms of energy:
  – electricity
  – heat
  – vehicle fuel
Which materials can produce biogas?

- **Agricultural waste**
  - Animal slurries
  - Harvest residues
  - Grass

- **Food processing waste**
  - Meat/fish processing waste
  - Dairy waste
  - Brewery spent grains
  - Vegetable waste
  - Waste from prepared food factories
  - Sludge from waste water treatment plants
## Potential Substrates

<table>
<thead>
<tr>
<th>Substrate</th>
<th>DM</th>
<th>Biogas yield</th>
<th>Methane-content</th>
<th>Primary energy</th>
<th>Electricity (net) 35%</th>
<th>Heat (net) 90%</th>
<th>Value Electricity</th>
<th>Value Heat</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pig manure</td>
<td>6</td>
<td>20</td>
<td>60</td>
<td>120</td>
<td>42</td>
<td>108</td>
<td>6.72 €</td>
<td>5.40 €</td>
</tr>
<tr>
<td>Whey</td>
<td>8.5</td>
<td>58.5</td>
<td>53</td>
<td>310</td>
<td>109</td>
<td>279</td>
<td>17.44 €</td>
<td>13.95 €</td>
</tr>
<tr>
<td>Brewer’s yeast</td>
<td>25</td>
<td>152</td>
<td>62</td>
<td>942</td>
<td>330</td>
<td>848</td>
<td>52.77 €</td>
<td>42.39 €</td>
</tr>
<tr>
<td>Potato slip</td>
<td>19</td>
<td>108</td>
<td>54</td>
<td>540</td>
<td>189</td>
<td>486</td>
<td>30.24 €</td>
<td>24.30 €</td>
</tr>
<tr>
<td>Slaughterwastes</td>
<td>15</td>
<td>60</td>
<td>55</td>
<td>300</td>
<td>105</td>
<td>270</td>
<td>16.80 €</td>
<td>13.50 €</td>
</tr>
<tr>
<td>Residues from bakeries</td>
<td>77</td>
<td>570</td>
<td>53</td>
<td>3021</td>
<td>1027</td>
<td>2719</td>
<td>169.18 €</td>
<td>135.95 €</td>
</tr>
<tr>
<td>Maize silage</td>
<td>35</td>
<td>216</td>
<td>52</td>
<td>1123</td>
<td>393</td>
<td>1011</td>
<td>62.88 €</td>
<td>50.54 €</td>
</tr>
</tbody>
</table>
How can AD technology support agro-food companies?

• Recycling organic residues → time and cost savings

• Providing company with own produced electricity and heat
  – Covering energy demand of company and contributing to energy self-sufficiency of company
  – Improving company’s energy efficiency
  – Independence of energy providers and market prices (e.g. feed-in tariffs)
  – Reduction of energy costs
  – Sustainability of processes
AD implemented in agro-food industry
A holistic approach
Example of a farm small-scale biogas plant

Dairy farm, Gießen (Germany)

Small-scale biogas plant (installed capacity 75 kW).
Feedstocks: cattle slurry (10,950 m³/year)
Energy use: heat for self-consumption, electrical energy is fed into local power grid

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
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</thead>
<tbody>
<tr>
<td>Digester:</td>
<td>600 m³</td>
</tr>
<tr>
<td>Biogas valorisation unit:</td>
<td>75 kW boiler</td>
</tr>
<tr>
<td>Energy production:</td>
<td>630 MWhel/a; 740 MWhth/a</td>
</tr>
<tr>
<td>Investment:</td>
<td>€500,000,--</td>
</tr>
</tbody>
</table>

Estimated payback period = 6 years

Data obtained from a report of Bio4Gas GmbH
Example of a farm small-scale biogas plant

Fahringer farm, Rettenschöss (Austria)

Small-scale biogas plant (self-built, low-cost).

**Feedstocks:** whey, cattle slurry (from 50 cows)

**Energy use:** Heat for the housing and the cheese plant

<table>
<thead>
<tr>
<th>Digester:</th>
<th>150m³</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biogas valorisation unit:</td>
<td>50kW boiler</td>
</tr>
<tr>
<td>Gas production:</td>
<td>150-180m³ biogas/day</td>
</tr>
<tr>
<td>Investment:</td>
<td>€35,000,--</td>
</tr>
</tbody>
</table>

Data obtained from a report of BIOREGIONS project (www.bioregions.eu)

Estimated payback period = 7 years
Example of a farm small-scale biogas plant

Methanogen, Waterford

Feedstocks: waste water treatment sludge waste
Energy use: Heat to heat digester and to heat domestic house

Built 1992 – running ever since

Digester: 2 x 70m³ insulated concrete tanks, Fibreglass top
Biogas valorisation unit: 50kW heat output, running 24h/d
Energy production: 1,200kWh/day
Investment: €35,000,–, payback period: 6 years
University of Southampton Science Park (UK)

**Small-scale biogas plant, containerized**

**Feedstocks:** 410 l/d of kitchen food waste, cooking oil and spent alcoholic drinks

**Energy use:** Electricity and heat used in the business park offices and research labs

<table>
<thead>
<tr>
<th>Biogas valorisation unit:</th>
<th>8 kW CHP engine</th>
</tr>
</thead>
<tbody>
<tr>
<td>Biogas production:</td>
<td>46 m3/d</td>
</tr>
<tr>
<td>Electricity production:</td>
<td>35 MWh/a</td>
</tr>
<tr>
<td>Investment:</td>
<td>€ 120.000,--</td>
</tr>
</tbody>
</table>

| Annual operation and maintenance costs: | 6.000 € |
| Energy savings:                        | 3.380 € |
| Heat savings:                          | 1.810 € |
| Waste management savings:              | 12.470 €|
| Digestate value:                       | 1.170 € |

Payback period: 4 years (with feed-in tariffs). Estimated 9 years without feed-in tariffs.
What can BIOGAS³ do for me?

- **Free training courses & workshops**
  - On-line and face-to-face
  - Choice of basic courses, specialised workshops, webinars...

- **Personalised feasibility studies**
  - With the software smallBIOGAS, to check if your feedstock and site are suitable for a small-scale biogas plant.

- **Networking and one-to-one activities**
  - Contact to specialised biogas plant technologists and technology centres that will help you to outline the best project

- **Implementation of new small-scale biogas plants**
1. General data
   - Name: [Enter name]
   - Country: Ireland, Spain, France, Italy, Germany, Poland, Ireland, Sweden

2. Administrative division
   - Munster

3. Annual average temperature (°C):
   - 9.5

The results obtained from the use of the tool provide to the user an orientation about the viability of a small-scale biogas plant. For this reason, the authors recommend further consultation with expert centres before carrying out a project of biogas plant and are not responsible for any damages resulting from the use made of the tool smallBIOGAS.
Online Training
1. Log-in
   - visit www.renewables-online.de (works best with Firefox and Google Chrome)
   - Access data has been provided (username = email address, password in email, has to be changed by you when you have logged in for the first time)

2. Profile settings
   - Personalize your profile settings
   - In this section you can also
     - upload your profile picture
     - set your local time
     - change your password
     - change messaging settings
     - change the language of the platform menus
       (please note: this will not change the language of course content)
3. Structure of the BIOGAS3 Online Training
   - Six chapters with respective subchapters

4. Change chapters via the table of contents or via the arrows at the side of the screen page
5. **Forum**

- One forum for organisational issues, where participants can ask any question regarding the functioning or organisation of the online course.
- One forum for discussion of the course content, regarding learning material and exchange of experiences with BIOGAS3 staff and other participants.
Online Training

6. Exam
   - To obtain a BIOGAS3 certificate participants can take a short (20min) exam (passing mark: 70%).
   - In January, participants will be asked if they would like to participate in a test
   - In case of positive answers, the test will be offered in the respective languages

7. Evaluation
   - We will distribute an online questionnaire in all languages to participants, to evaluate the Online Training at the end
Thank you for your attention